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ABSTRACT:
PROBLEM TO BE SOLVED: To provide a stator of a superconducting dynamo-electric machine which can prevent overheat caused by the eddy current loss on the side of core end of the stator which occurs by the leaked magnetic flux of a superconducting rotor coil.

SOLUTION: In the stator of a superconducting dynamo-electric machine which is equipped with a stator core 11 which is arranged concentrically through space outside a rotor 9 whereon a superconducting rotor coil 10 is wound, magnetic flux shunts 13 which are installed with their inside peripheries spreading outward at both ends of the stator core 11 being made in cylindrical form by stacking magnetic material in axial direction, and a stator coil 16 which is wound on the stator core 11 and both whose ends are

projected to the vicinity
of both ends 10a in axial direction of the superconducting
rotor coil 10 of the
rotor 9, the axial ends 13a of the magnetic flux shunts 13
are positioned
outside of the axial both ends 10 of the superconducting
rotor coil 10.

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MAEDA SUSUMU

(54) STATOR OF SUPERCONDUCTIVE DYNAMO-ELECTRIC MACHINE

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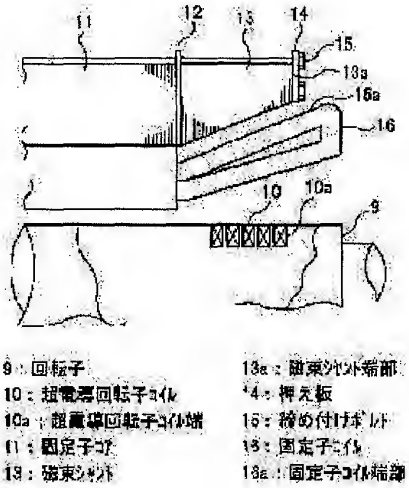

9：回転子
10：超電導回転子コイル
10a：超電導回転子コイル端
11：固定子コア
13：磁束シント
13a：磁束シント端部
14：押え板
15：締め付けボルト
16：固定子コイル
16a：固定子コイル端部

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3/24		3/24	Ｊ	５Ｈ６０４
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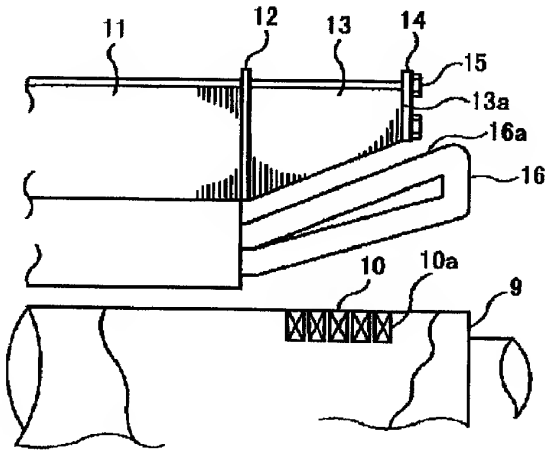
最終頁に続く

(54)【発明の名称】　超電導回転電機の固定子

(57)【要約】
【課題】　超電導回転子コイルの漏れ磁束で発生する固定子コア端部側の渦電流損による過熱を防止することが可能な超電導回転電機の固定子を提供する。
【解決手段】　超電導回転子コイル１０が巻装された回転子９の外径側に空隙を介して同心上に配置された固定子コア１１と、磁性材を軸方向に積層して円筒状に形成され固定子コア１１の両端部に内周面を外広がりにして設置された磁束シャント１３と、固定子コア１１に巻装され両端部１６ａが回転子９の超電導回転子コイル１０の軸方向両端１０ａ近傍まで突出して形成された固定子コイル１６とを備えた超電導回転電機の固定子において、磁束シャント１３の軸方向端部１３ａを超電導回転子コイル１０の軸方向両端１０ａよりも外側に位置させた。



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14：押え板
15：締め付けﾎﾞﾙﾄ
16：固定子ｺｲﾙ
16a：固定子ｺｲﾙ端部

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【特許請求の範囲】

【請求項1】　超電導回転子コイルが巻装された回転子の外径側に空隙を介して同心上に配置された固定子コアと、磁性材を軸方向に積層して円筒状に形成され上記固定子コアの両端部に内周面を外広がりにして設置された磁束シャントと、上記固定子コアに巻装され両端部が上記回転子の上記超電導回転子コイルの軸方向両端近傍まで突出して形成された固定子コイルとを備えた超電導回転電機の固定子において、上記磁束シャントの軸方向端部を上記超電導回転子コイルの軸方向両端よりも外側に位置させたことを特徴とする超電導回転電機の固定子。

【請求項2】　磁束シャントは磁性材積層間の少なくとも1箇所に所定の剛性を有し形成された板状部材を介在させるとともに上記磁束シャントの軸方向端部に配設された押え板を押圧することにより一体化されていることを特徴とする請求項1に記載の超電導回転電機の固定子。

【請求項3】　板状部材より軸方向外側の磁性材は上記板状部材と内周面に段差を有するよう形成され、上記段差部を介して上記板状部材を押圧可能としたことを特徴とする請求項2に記載の超電導回転電機の固定子。

【請求項4】　押え板はリング形状に形成されていることを特徴とする請求項2または3に記載の超電導回転電機の固定子。

【請求項5】　磁束シャントと固定子コイル端部間に上記磁束シャントの内周面に沿って形成された筒状絶縁部材を介在するようにしたことを特徴とする請求項1に記載の超電導回転電機の固定子。

【請求項6】　磁束シャントと固定子コイル端部間に上記固定子コイル端部との間に所定の間隙を介して上記磁束シャントの内周面に沿って形成された筒状絶縁部材を配置するとともに上記間隙に矩形状絶縁部材を配置し上記矩形状絶縁部材を上記固定子コイル端部に締め付け固定するようにしたことを特徴とする請求項1に記載の超電導回転電機の固定子。

【請求項7】　磁束シャントと固定子コイル端部間に上記固定子コイル端部との間に所定の間隙を介して上記磁束シャントの内周面に沿って形成された筒状絶縁部材を配置するとともに上記間隙に一対のクサビ状絶縁部材を挿入し固定したことを特徴とする請求項1に記載の超電導回転電機の固定子。

【請求項8】　磁束シャントには半径方向の内側から外側に放射状に貫通する複数の通気孔を有するとともに筒状絶縁部材の上記通気孔と対する面には上記通気孔と連通し軸方向の外部に開口する通気用の溝が形成されていることを特徴とする請求項5ないし7のいずれかに記載の超電導回転電機の固定子。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、超電導回転電機

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の固定子に関し、特に固定子コア端の過熱に対する改良に関するものである。

【0002】

【従来の技術】図18はこの種の従来の超電導回転電機の構成を示す断面図、図19は図18における部分側面図である。図において、1は超電導回転子コイル2が巻装された回転子、2aは超電導回転子コイル2の軸方向端、3は回転子1の外径側に空隙を介して同心上に配置され電磁鋼板等の磁性材を積層して円環状に形成した固定子コア、4はリング状で固定子コア3の軸方向端面に所定の剛性を有し配置されたクランパ、5は電磁鋼板等の磁性材を軸方向に積層して円筒状に形成され、クランパ4を介して固定子コア3の両端部に内周面を外広がりにして設置された磁束シャント、6は磁束シャント5の軸方向端面5aにセグメント形状で所定の剛性を有し、周方向に間隔を介して配置された押え板、7は固定子コア3、クランパ4、磁束シャント5および押え板6を軸方向に貫通し、両側の押え板6を介して軸方向に締め付け固定する締付ボルト、8は固定子コア3の内周部に例えば絶縁材あるいは非磁性金属からなる歯部（図示してない）で固定して固定子コア3に巻装され、両端部8aが回転子1の超電導回転子コイル2の軸方向両端2a近傍まで突出して形成された固定子コイルである。

【0003】上記のように構成された超電導回転電機例えば発電機は、通常の発電機と比べ、固定子コア3の積長が短い、これに対し固定子コイル8の固定子コア3より突出した端部8aの長さは通常の発電機と大差無いため、超電導発電機は固定子コイル8の軸方向全長に占める固定子コア3より突出している固定子コイル8の端部8aの割合が大きく、この突出している端部8aでの発電効果が大きい。このため、回転子1の超電導回転子コイル2の軸方向両端2aの位置を固定子コイル8の両端8aの近傍になるように巻装して、この位置で対応する固定子コイル8の端部8aにも磁束が鎖交するようにして発電効率を上げている。なお、固定子コア3の端部には超電導回転子コイル2および固定子コイル8の端部8aからの漏れ磁束が侵入する。この漏れ磁束は、超電導回転子コイル2、固定子コイル8のN極から押え板6、磁束シャント5等を円周方向に通りS極へ至る。この時固定子コア3端面に垂直に軸方向に侵入する漏れ磁束により固定子コア3の端部側で渦電流損失が発生し、固定子コア3の端部側での過熱が起こる可能性がある。ここで、固定子コア3の端部側に設置された磁束シャント5が漏れ磁束を円周方向に流す経路となり、これによって磁束がクランパ4に侵入するのを防止し渦電流発生による過熱を防いでいる。また、押え板6はセグメント形状で円周方向に分離して配置してあるので、円周方向に流れようとする漏れ磁束が遮断でき渦電流による過熱を防げる。

【0004】

【発明が解決しようとする課題】従来の超電導回転電機の固定子は上記のように構成され、漏れ磁束の侵入や磁束シャント５で防ぐようにしているが、超電導回転子コイル２の軸方向巻回位置を固定子コイル８の端部８ａと対応させ回転子の作る起磁力を効率良く発生させるようにした超電導回転電機では、漏れ磁束の量も増加するとともに図２０の漏れ磁束の流れ説明図に示すように磁束シャント５の端面５ａに垂直に軸方向に鎖交する磁束が増大することで渦電流損が増大し過熱を発生しやすいという問題点があった。

【０００５】この発明は上記のような問題点を解消するためになされたもので、超電導回転子コイルの漏れ磁束で発生する固定子コア端部側の渦電流損による過熱を防止できる超電導回転電機の固定子を提供することを目的とするものである。

【０００６】

【課題を解決するための手段】この発明の請求項１に係る超電導回転電機の固定子は、超電導回転子コイルが巻装された回転子の外径側に空隙を介して同心上に配置された固定子コアと、磁性材を軸方向に積層して円筒状に形成され固定子コアの両端部に内周面を外広がりにして設置された磁束シャントと、固定子コアに巻装され両端部が回転子の超電導回転子コイルの軸方向両端近傍まで突出して形成された固定子コイルとを備えた超電導回転電機の固定子において、磁束シャントの軸方向端部を超電導回転子コイルの軸方向両端よりも外側に位置させたものである。

【０００７】また、この発明の請求項２に係る超電導回転電機の固定子は、請求項１において、磁束シャントは磁性材積層間の少なくとも１箇所に所定の剛性を有し形成された板状部材を介在させるとともに磁束シャントの軸方向端部に配設された押え板を押圧することにより一体化されているものである。

【０００８】また、この発明の請求項３に係る超電導回転電機の固定子は、請求項２において、板状部材より軸方向外側の磁性材は板状部材と内周面に段差を有するよう形成され、段差部を介して板状部材を押圧可能としたものである。

【０００９】また、この発明の請求項４に係る超電導回転電機の固定子は、請求項２または３において、押え板はリング形状に形成されているものである。

【００１０】また、この発明の請求項５に係る超電導回転電機の固定子は、請求項１において、磁束シャントと固定子コイル端部間に磁束シャントの内周面に沿って形成された筒状絶縁部材を介在するようにしたものである。

【００１１】また、この発明の請求項６に係る超電導回転電機の固定子は、請求項１において、磁束シャントと固定子コイル端部間に固定子コイル端部との間に所定の間隙を介して磁束シャントの内周面に沿って形成された筒状絶縁部材を配置するとともに間隙に矩形状絶縁部材を配置し矩形状絶縁部材を固定子コイル端部に締め付け固定するようにしたものである。

【００１２】また、この発明の請求項７に係る超電導回転電機の固定子は、請求項１において、磁束シャントと固定子コイル端部間に固定子コイル端部との間に所定の間隙を介して磁束シャントの内周面に沿って形成された筒状絶縁部材を配置するとともに間隙に一対のクサビ状絶縁部材を挿入し固定したものである。

【００１３】また、この発明の請求項８に係る超電導回転電機の固定子は、請求項５ないし７のいずれかにおいて、磁束シャントには半径方向の内側から外側に放射状に貫通する複数の通気孔を有するとともに筒状絶縁部材の通気孔と対する面には通気孔と連通し軸方向の外部に開口する通気用の溝が形成されているものである。

【００１４】

【発明の実施の形態】実施の形態１．以下、この発明の実施の形態１を図に基づいて説明する。図１はこの発明の実施の形態１による超電導回転電機の構成を示す断面図、図２は図１における部分側面図である。図において、９は超電導回転子コイル１０が巻装された回転子、１０ａは超電導回転子コイル１０の軸方向端、１１は回転子９の外径側に空隙を介して同心上に配置された電磁鋼板等の磁性材を積層して円環状に形成した固定子コア、１２はリング状で固定子コア１１の軸方向端面に所定の剛性を有し配置されたクランパ、１３は電磁鋼板等の磁性材を軸方向に積層して円筒状に形成され、軸方向端部１３ａを超電導回転子コイル１０の軸方向両端１０ａよりも外側に位置させ、クランパ１２を介し固定子コア１１の両端部に内周面を外広がりにして設置された磁束シャント、１４は磁束シャント１３の軸方向端面にセグメント形状で所定の剛性を有し、周方向に間隔を介し配置された押え板、１５は固定子コア１１、クランパ１２、磁束シャント１３および押え板１４を軸方向に貫通し、両側の押え板１４を介し軸方向に締め付け固定する締め付けボルト、１６は固定子コア１１の内周部に例えば絶縁材あるいは非磁性金属からなる歯部（図示してない）で固定して固定子コア１１に巻装され、両端部１６ａが回転子９の超電導回転子コイル１０の軸方向両端１０ａ近傍まで突出して形成された固定子コイルである。

【００１５】上記のように構成された超電導回転電機の固定子は、超電導回転子コイル１０および固定子コイル１６からの漏れ磁束は、図３の漏れ磁束の流れ説明図に示すように、主に磁束シャント１３の内周側の磁性材の積層部を侵入することになり、従来の構成で示した図２０の漏れ磁束の流れ説明図に比較して、固定子コア１１の端部の端面に対し垂直に軸方向に侵入する磁束量が大幅に減少する。このため固定子コア１１の端部での渦電流損の発生を抑制することができる。

【００１６】このように実施の形態１によれば、磁束シ

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ャント１３の軸方向端部１３ａの超電導回転子コイル１０の軸方向両端１０ａよりも外側に位置させるようにしたので、漏れ磁束で発生する固定子コア１１端部側の渦電流損による過熱を防ぐことが可能である。

【００１７】実施の形態２．図４はこの発明の実施の形態２における超電導回転電機の構成を示す断面図である。図において、実施の形態１におけると同様な部分は同一符号を付してその説明は省略する。１７は磁束シャント１３の磁性材積層間に所定の剛性を有し介在させた鋼板等の板状部材である。

【００１８】このように実施の形態２によれば、磁束シャント１３は磁性材積層間に所定の剛性を有し形成された板状部材１７を介在させるとともに、磁束シャント１３の軸方向端部に配設された押え板１４を押圧することにより一体化されているので、磁束シャント１３の積層面の押圧を均等化でき固定子コア１１を強固に締め付けすることができる。なお、この実施の形態２では積層間の１箇所に板状部材１７を介在させたものを示したが、複数箇所に介在させるようにしてもよい。

【００１９】実施の形態３．図５はこの発明の実施の形態３における超電導回転電機の構成を示す断面図、図６は図５における部分側面図である。図において、実施の形態２におけると同様な部分は同一符号を付してその説明は省略する。１８は板状部材１７より軸方向外側の磁束シャント１３の磁性材が板状部材１７と内周面に段差ｄを形成するよう設けられた段差部、１９は固定子コア１１、クランパ１２、磁束シャント１３および板状部材１７を軸方向に貫通し両側の板状部材１７を介し軸方向に締め付け固定する締め付けボルトである。

【００２０】このように実施の形態３によれば、板状部材１７より軸方向外側の磁束シャント１３の磁性材は板状部材１７と内周面に段差ｄを有するよう形成され段差部１８を介して板状部材１７を押圧可能としたので、内径側の締め付けが強化され固定子コア１１との一体化をさらに強固にすることが可能である。

【００２１】実施の形態４．図７はこの発明の実施の形態４における超電導回転電機の構成を示す断面図、図８は図７における部分側面図である。図において、実施の形態３におけると同様な部分は同一符号を付してその説明は省略する。２０はリング形状で磁束シャント１３の軸方向端面に所定の剛性を有し配置された押え板で、締め付けボルト１５の締め付けにより軸方向に押圧される。

【００２２】このように実施の形態４によれば、押え板２０をリング形状にしたので、磁束シャント１３の固定子コア１１との一体化をさらに強固に締め付けすることが可能となる。

【００２３】実施の形態５．図９はこの発明の実施の形態５における超電導回転電機の構成を示す断面図、図１０は図９における部分側面図である。図において、実施

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の形態４におけると同様な部分は同一符号を付してその説明は省略する。２１は板状部材１７より軸方向外側の磁束シャント１３の磁性材が板状部材１７と内周面で締め付けボルト１９が介在する部分のみに段差を形成するよう設けられた段差部で、磁束シャント１３の板状部材１７より軸方向外側の磁性材内径を締め付けボルト１９が貫通する位置の周囲のみ部分的に切除したものである。

【００２４】このように実施の形態５によれば、段差部２１を締め付けボルト１９が貫通する位置の周囲のみとしたので、板状部材１７の外側に露出する面が小さくなり板状部材１７で発生する渦電流損失を実施の形態３に比較して小さくすることが可能である。

【００２５】実施の形態６．図１１はこの発明の実施の形態６における超電導回転電機の構成を示す断面図である。図において、実施の形態４におけると同様な部分は同一符号を付してその説明は省略する。２２は磁束シャント１３と固定子コイル１６の端部１６ａの間に介在するように磁束シャント１３の内周面に沿ったコーン形状に形成して配置され、例えばガラスエポキシ材等でなる筒状絶縁部材である。

【００２６】このように実施の形態６によれば、磁束シャント１３と固定子コイル１６の端部１６ａ間に筒状絶縁部材２２を介在するようにしたので、固定子コイル１６の端部１６ａの表面電位が高電圧の部分と磁束シャント１３間の絶縁距離を確保することができるとともに固定子コイル１６の端部１６ａを強固に支持することが可能である。

【００２７】実施の形態７．図１２はこの発明の実施の形態７における超電導回転電機の構成を示す断面図である。図において、実施の形態６におけると同様な部分は同一符号を付してその説明は省略する。２３は磁束シャント１３と固定子コイル１６の端部１６ａ間に固定子コイル１６の端部１６ａとの間に所定の間隙を介し磁束シャント１３の内周面に沿ったコーン形状に形成して配置され、例えばガラスエポキシ等でなる筒状絶縁部材、２４は筒状絶縁部材２３と固定子コイル１６の端部１６ａ間の間隙に周方向複数配置され、例えばガラスエポキシ材等で矩形状に形成された矩形状絶縁部材で、固定子コイル１６の端部１６ａにここでは縛りひも２５あるいは緩衝材などで締め付け固定される。

【００２８】このように実施の形態７によれば、磁束シャント１３と固定子コイル１６の端部１６ａ間に固定コイル１６の端部１６ａとの間に所定の間隙を介して筒状絶縁部材２３を配置するとともに所定の間隙に矩形状絶縁部材２４を配置し矩形状絶縁部材２４を固定子コイル１６の端部１６ａに締め付け固定するようにしたので、固定子コイル１６の端部１６ａと磁束シャント１３間の絶縁距離を確保するとともに固定子コイル１６の端部１６ａを強固に支持することが可能である。なお、上記実

施の形態７では矩形状絶縁部材２４を固定子コイル１６の端部１６ａに縛り付けたものを示したが、同様に筒状絶縁部材２３を磁束シャント１３に固定するようにすれば支持がさらに強固になる。

【００２９】実施の形態８．図１３はこの発明の実施の形態８における超電導回転電機の構成を示す断面図である。図において、実施の形態７におけると同様な部分は同一符号を付してその説明は省略する。２６は筒状絶縁部材２３と固定子コイル１６の端部１６ａ間の間隙に一対をクサビ状に形成して、周方向に複数挿入された例えばガラスエポキシ材等でなるクサビ状絶縁部材である。

【００３０】このように実施の形態８によれば、筒状絶縁部材２３と固定子コイル１６の端部１６ａ間の間隙に一対のクサビ状部材２６を挿入し固定するようにしたので、筒状絶縁部材２３を容易に固定することができ固定子コイル１６の端部１６ａを強固に支持することが可能である。

【００３１】実施の形態９．図１４はこの発明の実施の形態９における超電導回転電機の構成を示す断面図、図１５は図１４における線ＸＩＶ－ＸＩＶに沿った平面図である。図において、実施の形態７におけると同様な部分は同一符号を付してその説明は省略する。２７は磁束シャント１３に半径方向の内側から外側に放射状に貫通して設けられた複数の通気孔、２８は筒状絶縁部材２３の通気孔２７と対する面に通気孔２７と軸方向に連通し軸方向の外部に開口して設けられた通気用溝である。

【００３２】このように実施の形態９によれば、磁束シャント１３に半径方向の内側から外側に放射状に貫通する複数の通気孔２７を設けるとともに、筒状絶縁部材２３の通気孔２７と対する面に通気孔２７と軸方向に連通し軸方向の外部に開口する通気用溝２８が設けられているので、冷媒気体の通気回路が形成され磁束シャント１３を有効に冷却し過熱を防止することができる。

【００３３】実施の形態１０．図１６はこの発明の実施の形態１０における超電導回転電機の構成を示す断面図、図１７は図１６における線ＸＶＩ－ＸＶＩに沿った平面図である。図において、実施の形態８におけると同様な部分は同一符号を付してその説明は省略する。２９は筒状絶縁部材２３の通気孔２７と対する面に通気孔２７と軸方向および周方向に連通し軸方向の外部に開口して設けられた通気用溝である。

【００３４】このように実施の形態１０によれば、通気孔２７と接する筒状絶縁部材２３の通気孔２７と対する面に通気孔２７と軸方向および周方向に連通し軸方向の外部に開口する通気用溝２９が設けられているので、冷却気体の通気回路が形成され磁束シャント１３をさらに有効に冷却し過熱を防止することができる。

【００３５】

【発明の効果】以上のようにこの発明の請求項１によれば、超電導回転子コイルが巻装された回転子の外径側に空隙を介して同心上に配置された固定子コアと、磁性材を軸方向に積層して円筒状に形成され固定子コアの両端部に内周面を外広がりにして設置された磁束シャントと、固定子コアに巻装され両端部が回転子の超電導回転子コイルの軸方向両端近傍まで突出して形成された固定子コイルとを備えた超電導回転電機の固定子において、磁束シャントの軸方向端部を超電導回転子コイルの軸方向両端よりも外側に位置させたので、漏れ磁束で発生する固定子コア端部側の渦電流損による過熱を防止させることが可能な超電導回転電機の固定子を提供することができる。

【００３６】また、この発明の請求項２によれば、請求項１において、磁束シャントは磁性材積層間の少なくとも１箇所に所定の剛性を有し形成された板状部材を介在させるとともに磁束シャントの軸方向端部に配設された押え板を押圧することにより一体化されているので、磁束シャントの積層面の押圧を均等化でき固定子コアを強固に締め付けすることが可能な超電導回転電機の固定子を提供することができる。

【００３７】また、この発明の請求項３によれば、請求項２において、板状部材より軸方向外側の磁性材は板状部材と内周面に段差を有するよう形成され、段差部を介して板状部材を押圧可能としたので、内径側の締め付けが強化され固定子コアをさらに強固に締め付けすることが可能な超電導回転電機の固定子を提供することができる。

【００３８】また、この発明の請求項４によれば、請求項２または３において、押え板はリング形状に形成されているので、固定子コアを強固に締め付けすることが可能な超電導回転電機の固定子を提供することができる。

【００３９】また、この発明の請求項５によれば、請求項１において、磁束シャントと固定子コイル端部間に磁束シャントの内周面に沿って形成された筒状絶縁部材を介在するようにしたので、両者間での絶縁距離を確保することができるとともに固定子コイル端部を強固に支持することが可能な超電導回転電機の固定子を提供することができる。

【００４０】また、この発明の請求項６によれば、請求項１において、磁束シャントと固定子コイル端部間に固定子コイル端部との間に所定の間隙を介して磁束シャントの内周面に沿って形成された筒状絶縁部材を配置するとともに間隙に矩形状絶縁部材を配置し矩形状絶縁部材を固定子コイル端部に締め付け固定するようにしたので、固定子コイル端部をさらに強固に支持することが可能な超電導回転電機の固定子を提供することができる。

【００４１】また、この発明の請求項７によれば、請求項１において、磁束シャントと固定子コイル端部間に固定子コイル端部との間に所定の間隙を介して磁束シャントの内周面に沿って形成された筒状絶縁部材を配置するとともに間隙に一対のクサビ状絶縁部材を挿入し固定し

たので、筒状絶縁部材を容易に固定することができ固定子コイル端部を強固に支持することが可能な超電導回転電機の固定子を提供することができる。

【００４２】また、この発明の請求項８によれば、請求項５ないし７のいずれかにおいて、磁束シャントには半径方向の内側から外側に放射状に貫通する複数の通気孔を有するとともに筒状絶縁部材の通気孔と対する面には通気孔と連通し軸方向の外部に開口する通気用の溝が形成されているので、冷媒気体の通気回路が形成され磁束シャントを有効に冷却し過熱を防止することが可能な超電導回転電機の固定子を提供することができる。

【図面の簡単な説明】

【図１】　この発明の実施の形態１における超電導回転電機の構成を示す断面図である。

【図２】　図１における部分側面図である。

【図３】　この発明の構成における漏れ磁束の流れ説明図である。

【図４】　この発明の実施の形態２における超電導回転電機の構成を示す断面図である。

【図５】　この発明の実施の形態３における超電導回転電機の構成を示す断面図である。

【図６】　図５における部分側面図である。

【図７】　この発明の実施の形態４における超電導回転電機の構成を示す断面図である。

【図８】　図７における部分側面図である。

【図９】　この発明の実施の形態５における超電導回転電機の構成を示す断面図である。

【図１０】　図９における部分側面図である。

【図１１】　この発明の実施の形態６における超電導回転電機の構成を示す断面図である。

【図１２】　この発明の実施の形態７における超電導回転電機の構成を示す断面図である。

【図１３】　この発明の実施の形態８における超電導回転電機の構成を示す断面図である。

【図１４】　この発明の実施の形態９における超電導回転電機の構成を示す断面図である。

【図１５】　図１４における線ＸＩＶ－ＸＩＶに沿った平面図である。

【図１６】　この発明の実施の形態１０における超電導回転電機の構成を示す断面図である。

【図１７】　図１６における線ＸＶＩ－ＸＶＩに沿った平面図である。

【図１８】　従来の超電導回転電機の構成を示す断面図である。

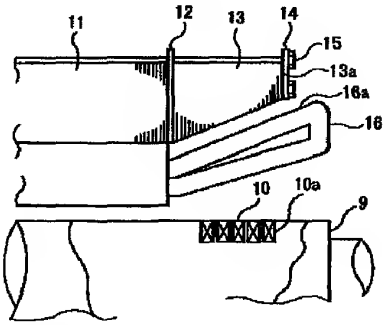
【図１９】　図１８における部分側面図である。

【図２０】　従来の構成における漏れ磁束の流れ説明図である。

【符号の説明】

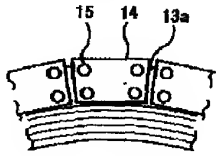
９　回転子、１０　超電導回転子コイル、１０ａ　超電導回転子コイル端、１１　固定子コア、１３　磁束シャント、１３ａ　磁束シャント端部、１４　押え板、１５　締め付けボルト、１６　固定子コイル、１６ａ　固定子コイル端部、１７　板状部材、１８　段差部、１９　締め付けボルト、２０　押え板、２１　段差部、２２　筒状絶縁部材、２３　筒状絶縁部材、２４　矩形状絶縁部材、２６　クサビ状絶縁部材、２７　通気孔、２８　通気用溝、２９　通気用溝。

【図１】



9：回転子
10：超電導回転子コイル
10a：超電導回転子コイル端
11：固定子コア
13：磁束シャント
13a：磁束シャント端部
14：押え板
15：締め付けボルト
16：固定子コイル
16a：固定子コイル端部

【図２】



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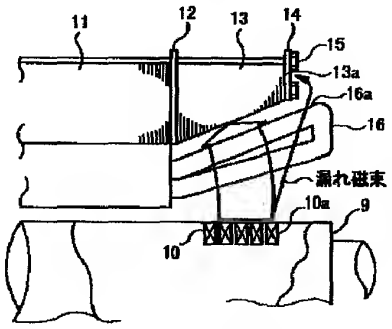

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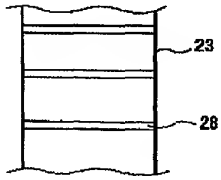

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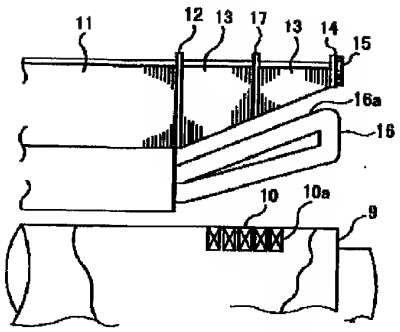
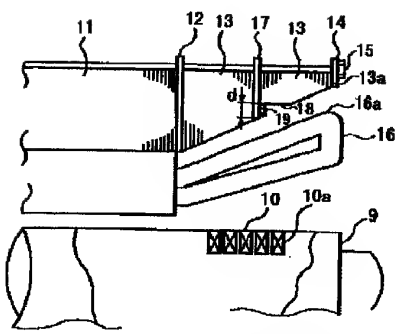


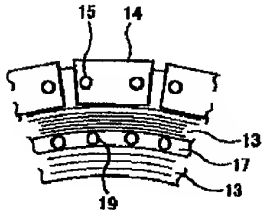
17：板状部材

【図5】



18：段差部
19：締め付けボルト

【図6】



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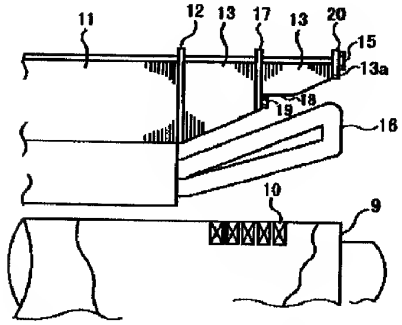
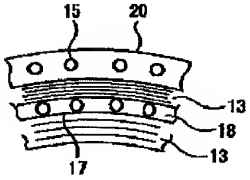


20：押え板

【図8】



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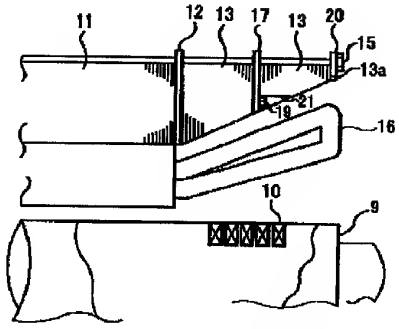
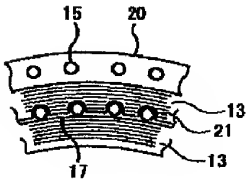


21：段差部

【図10】



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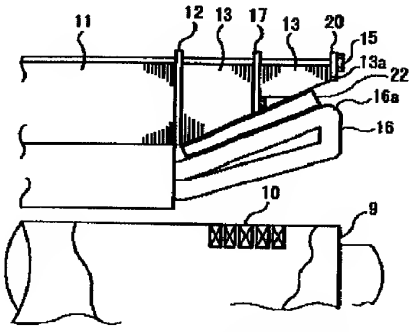
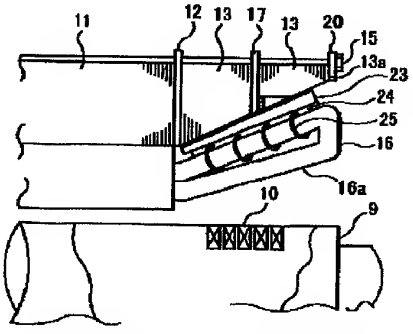


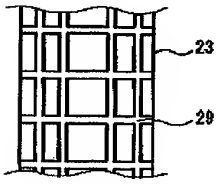
22：筒状絶縁部材

【図12】

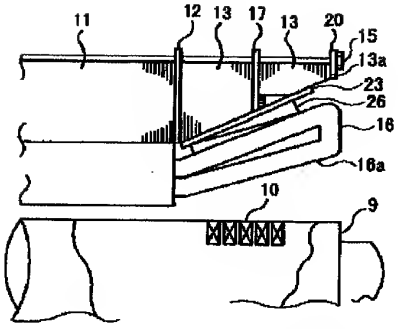


23筒状絶縁部材　　24：矩形状絶縁部材

【図17】

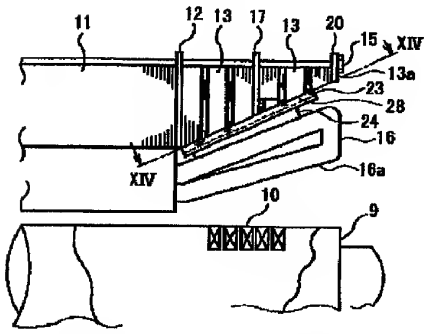


【図１３】



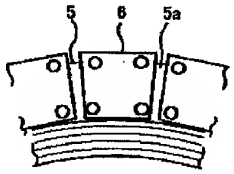
26：ｸｻﾋﾞ状絶縁部材

【図１４】



27：通気孔　　28：通気用溝

【図１９】



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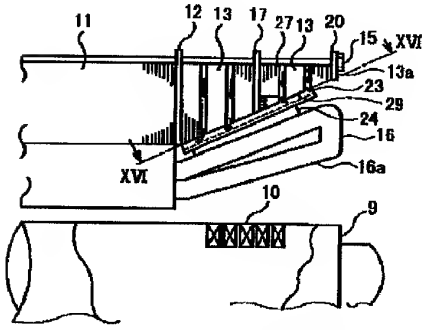
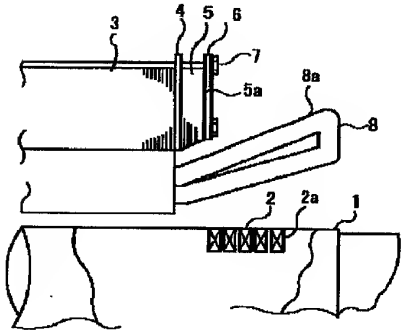
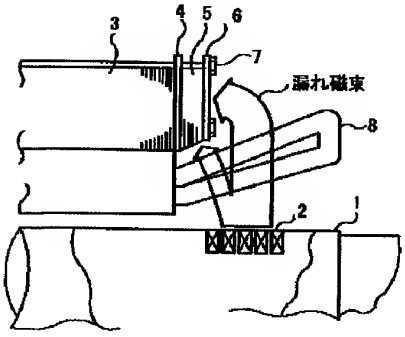


29：通気用溝

【図１８】



【図２０】



フロントページの続き

Ｆターム(参考)　5H002 AA02 AA10 AD05 AE08
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BB09 BB12 CA01 CA05 CB03
CB16 CB26 CC03 CC17 EE13
FA06 FA13 FA24
5H604 AA01 AA05 BB03 BB10 BB14
BB18 CC01 DB02 DB24 PB04
QA08 QB12
5H655 BB01 BB04 BB09 CC15 EE26
EE36

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed description]
[0001]
[The technical field to which invention belongs] Especially this invention relates to the enhancement to overheating of a stator core edge about the stator of superconductivity rotation electrical machinery.
[0002]
[Prior art] Drawing 18 is the cross section showing the configuration of this kind of conventional superconductivity rotation electrical machinery, and a partial side elevation [in drawing 18 in drawing 19]. In drawing, the rotator and 2a which, as for 1, were wound with the superconductivity rotator coil 2 The shaft-orientations edge of the superconductivity rotator coil 2, The stator core which 3 has been arranged on this core through a void, carried out the laminating of the magnetic material, such as a magnetic steel sheet, to the outer-diameter side of a rotator 1, and was formed in a circle, The clamper which 4 has predetermined rigidity in the shaft-orientations end face of the stator core 3 by the shape of a ring, and has been arranged, The magnetic-flux shunt which 5 carries out the laminating of the magnetic material, such as a magnetic steel sheet, to shaft orientations, and was formed in the shape of a cylinder, and makes inner skin an outside breadth and was installed in the both ends of the stator core 3 through the clamper 4, 6 has the predetermined rigidity in a segment configuration in shaft-orientations end-face 5a of the magnetic-flux shunt 5. The pressure plate arranged through a spacing at the hoop direction and 7 penetrate the stator core 3, the clamper 4, the magnetic-flux shunt 5, and the pressure plate 6 to shaft orientations. Fix the locking bolt bound tight and fixed to shaft orientations through the pressure plate 6 of both sides, and 8 by the tooth part (illustrate and there is nothing) which turns into the inner circumference section of the stator core 3 from an insulating material or non-magnetic metal, and the stator core 3 is wound. It is the stator coil with which both-ends 8a projects and was formed to near the shaft-orientations ends 2a of the superconductivity rotator coil 2 of a rotator 1.
[0003] the superconductivity rotation electrical machinery, for example, the generator, constituted as mentioned above Compared with a usual generator, the length of edge 8a in which the product length of the stator core 3 projected from the stator core 3 of the stator coil 8 to this short great difference with a usual generator In order for there to be nothing, A superconductivity generator has the large rate of edge 8a of the stator coil 8 projected from the stator core 3 occupied for the shaft-orientations overall length of the stator coil 8, and its power generation effect in this projected edge 8a is large. For this reason, the position of shaft-orientations ends 2a of the superconductivity rotator coil 2 of a rotator 1 is wound so that it may become near the ends 8a of the stator coil 8, and as magnetic flux interlinks also to edge 8a of the stator coil 8 which corresponds in this position, the generating efficiency is gathered to it. In addition, the leakage flux from edge 8a of the superconductivity rotator coil 2 and the stator coil 8 trespasses upon the edge of the stator core 3. This leakage flux results from N pole of the superconductivity rotator coil 2 and the stator coil 8] in a circumferencial direction to the south pole through a pressure plate 6, the magnetic-flux shunt 5, etc. An eddy current loss may occur by the edge side of the stator core 3 by the leakage flux which invades into shaft orientations at right angles to stator core 3 end face at this time, and overheating by the side of the edge of the stator core 3 may happen. Here, the magnetic-flux shunt 5 installed in the edge side of the stator core 3 serves as the path which passes leakage flux to a circumferencial direction, it prevents that magnetic flux invades into a clamper 4 by this, and overheating by eddy current occurrence is prevented. Moreover, since it separates into a circumferencial direction and the pressure plate 6 is arranged in the segment configuration, it can intercept the leakage flux made into the method of flowing at a circumferencial direction, and can prevent overheating by the eddy current.
[0004]
[Object of the Invention] Although the stator of the conventional superconductivity rotation electrical machinery is constituted as mentioned above and irruption and the magnetic-flux shunt 5 of leakage flux are made to protect With the superconductivity rotation electrical machinery which was made to generate efficiently, the magnetomotive force from which the shaft-orientations **** position of the superconductivity rotator coil 2 is made to correspond with edge 8a of the stator coil 8, and a rotator makes it While the amount of leakage flux also increased, the eddy current loss increased by the magnetic flux interlinked to shaft orientations at right angles to end-face 5a of the magnetic-flux shunt 5 as shown in flowing explanatory drawing of the leakage flux of drawing 20 increasing, and there was a trouble of being easy to generate overheating.
[0005] It was made in order that this invention might cancel the above troubles, and it aims at offering the stator of the superconductivity rotation electrical machinery which can prevent overheating by the eddy current loss by the side of the stator core edge which occurs by the leakage flux of a superconductivity rotator coil.

[0006]
[The means for solving a technical problem] The stator of the superconductivity rotation electrical machinery concerning the claim 1 of this invention The stator core arranged on this core through a void at the outer-diameter side of the rotator wound with the superconductivity rotator coil, The magnetic-flux shunt which carries out the laminating of the magnetic material to shaft orientations, was formed in the shape of a cylinder, makes inner skin an outside breadth and was installed in the both ends of a stator core, A stator core is wound and the shaft-orientations edge of a magnetic-flux shunt is located outside the shaft-orientations ends of a superconductivity rotator coil in the stator of the superconductivity rotation electrical machinery equipped with the stator coil with which both ends project and were formed to near the shaft-orientations ends of the superconductivity rotator coil of a rotator.
[0007] Moreover, in the claim 1, the stator of the superconductivity rotation electrical machinery concerning the claim 2 of this invention is unified by ****ing the pressure plate ****ed by the shaft-orientations edge of a magnetic-flux shunt while the plate-like part material in which a magnetic-flux shunt has the predetermined rigidity between magnetic material laminatings, and was formed at least one place is made to intervene.
[0008] Moreover, in a claim 2, the magnetic material of a shaft-orientations outside is formed so that it may have a level difference in plate-like part material and inner skin, and the stator of the superconductivity rotation electrical machinery concerning the claim 3 of this invention makes **** of plate-like part material more possible than plate-like part material through the level difference section.
[0009] Moreover, in claims 2 or 3, the pressure plate is formed in the ring configuration for the stator of the superconductivity rotation electrical machinery concerning the claim 4 of this invention.
[0010] Moreover, the stator of the superconductivity rotation electrical machinery concerning the claim 5 of this invention is made to intervene the tubed insulation component formed along with the inner skin of a magnetic-flux shunt between the magnetic-flux shunt and the stator coil end in a claim 1.
[0011] Moreover, in a claim 1, it binds a rectangle-like insulation component tight to a stator coil end, and is made for the stator of the superconductivity rotation electrical machinery concerning the claim 6 of this invention to arrange a rectangle-like insulation component in a clearance, and to be fixed while it arranges the tubed insulation component formed along with the inner skin of a magnetic-flux shunt through the predetermined clearance between stator coil ends between the magnetic-flux shunt and the stator coil end.
[0012] Moreover, in a claim 1, the wedge-like insulation component of a couple is inserted in a clearance, and the stator of the superconductivity rotation electrical machinery concerning the claim 7 of this invention fixes to it while it arranges the tubed insulation component formed along with the inner skin of a magnetic-flux shunt through the predetermined clearance between stator coil ends between the magnetic-flux shunt and the stator coil end.
[0013] Moreover, while the stator of the superconductivity rotation electrical machinery concerning the claim 8 of this invention has two or more air holes penetrated from the radial inside outside to a magnetic-flux shunt at a radial in the claim 5 or either of 7, the slot for aeration which carries out opening is formed in the exterior of an air hole and run through shaft orientations in the field which receives with the air hole of a tubed insulation component.
[0014]
[Gestalt of implementation of invention] The gestalt 1 of implementation of this invention is explained below gestalt 1. of enforcement based on drawing. Drawing 1 is the cross section showing the configuration of the superconductivity rotation electrical machinery by the gestalt 1 of implementation of this invention, and a partial side elevation [in drawing 1 in drawing 2]. In drawing, the rotator and 10a which, as for 9, were wound with the superconductivity rotator coil 10 The shaft-orientations edge of the superconductivity rotator coil 10, The stator core which 11 carried out the laminating of the magnetic material, such as a magnetic steel sheet arranged on this core through a void at the outer-diameter side of a rotator 9, and was formed in a circle, The clamper which 12 has predetermined rigidity in the shaft-orientations end face of the stator core 11 by the shape of a ring, and has been arranged, 13 carries out the laminating of the magnetic material, such as a magnetic steel sheet, to shaft orientations, is formed in the shape of a cylinder, and locates shaft-orientations edge 13a outside shaft-orientations ends 10a of the superconductivity rotator coil 10. The magnetic-flux shunt which makes inner skin an outside breadth and was installed in the both ends of the stator core 11 through the clamper 12, 14 has the predetermined rigidity in a segment configuration in the shaft-orientations end face of the magnetic-flux shunt 13. The pressure plate arranged through a spacing at the hoop direction and 15 penetrate the stator core 11, the clamper 12, the magnetic-flux shunt 13, and the pressure plate 14 to shaft orientations. The clamping bolt bound tight and fixed to shaft orientations through the pressure plate 14 of both sides, It fixes by the tooth part (illustrate and there is nothing) which turns into the inner circumference section of the stator core 11 from an insulating material or non-magnetic metal, and the stator core 11 is wound with 16, and it is the stator coil which both-ends 16a projects to near the shaft-orientations ends 10a of the superconductivity rotator coil 10 of a rotator 9, and was formed.
[0015] The amount of magnetic flux in which the stator of the superconductivity rotation electrical machinery constituted as mentioned above invades into shaft orientations perpendicularly to the end face of the edge of the stator core 11 as compared with flowing explanatory drawing of the leakage flux of drawing 20 in which the leakage flux from the superconductivity rotator coil 10 and the stator coil 16 will invade into, and mainly showed the laminating section of the magnetic material by the side of the inner circumference of the magnetic-flux shunt 13 with the conventional configuration as shown in flowing explanatory drawing of the leakage flux of drawing 3 decreases sharply. For this reason, occurrence of the eddy current loss in the edge of the stator core 11 can be suppressed.

[0016] Thus, according to the gestalt 1 of enforcement, since it was made to make it located outside shaft-orientations ends 10a of the superconductivity rotator coil 10 of shaft-orientations edge 13a of the magnetic-flux shunt 13, it is possible to prevent overheating by the eddy current loss by the side of the stator core 11 edge which occurs by leakage flux.
[0017] Gestalt 2. drawing 4 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 2 of implementation of this invention. In drawing, also in the gestalt 1 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. 17 is the plate-like part material which it has [material] predetermined rigidity and made it intervene between the magnetic material laminatings of the magnetic-flux shunt 13, such as a steel plate.
[0018] Thus, according to the gestalt 2 of enforcement, since it is unified by ****ing the pressure plate 14 ****ed by the shaft-orientations edge of the magnetic-flux shunt 13 while the plate-like part material 17 which has predetermined rigidity and was formed between magnetic material laminatings is made to intervene, the magnetic-flux shunt 13 can carry out the equation of the **** of the laminating side of the magnetic-flux shunt 13, can bind the stator core 11 tight firmly and can carry out it. In addition, although the gestalt 2 of this enforcement showed the thing which made the plate-like part material 17 placed between one between laminatings, you may be made to make it placed between two or more places.
[0019] Gestalt 3. drawing 5 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 3 of implementation of this invention, and a partial side elevation [in drawing 5 in drawing 6]. In drawing, also in the gestalt 2 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. They are the level difference section in which 18 was prepared so that the magnetic material of the magnetic-flux shunt 13 of a shaft-orientations outside might form level difference d in the plate-like part material 17 and inner skin from the plate-like part material 17, and the clamping bolt which 19 penetrates the stator core 11, the clamper 12, the magnetic-flux shunt 13, and the plate-like part material 17 to shaft orientations, and is bound tight and fixed to shaft orientations through the plate-like part material 17 of both sides.
[0020] Thus, according to the gestalt 3 of enforcement, from the plate-like part material 17, since the magnetic material of the magnetic-flux shunt 13 of a shaft-orientations outside is formed so that it may have level difference d in the plate-like part material 17 and inner skin, and it made possible **** of the plate-like part material 17 through the level difference section 18, bolting by the side of a bore is strengthened, and it can strengthen the unification with the stator core 11 further.
[0021] Gestalt 4. drawing 7 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 4 of implementation of this invention, and a partial side elevation [in drawing 7 in drawing 8]. In drawing, also in the gestalt 3 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. 20 is the pressure plate which has predetermined rigidity in the shaft-orientations end face of the magnetic-flux shunt 13, and has been arranged in the ring configuration at it, and is ****ed by shaft orientations by bolting of a clamping bolt 15.
[0022] Thus, according to the gestalt 4 of enforcement, since the pressure plate 20 was made into the ring configuration, it is enabled to bind still firmly the unification with the stator core 11 of the magnetic-flux shunt 13 tight, and to carry out it.
[0023] Gestalt 5. drawing 9 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 5 of implementation of this invention, and a partial side elevation [in drawing 9 in drawing 10]. In drawing, also in the gestalt 4 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. 21 is the level difference section prepared so that the magnetic material of the magnetic-flux shunt 13 of a shaft-orientations outside might form a level difference only in the fraction between which it is placed by the clamping bolt 19 by the plate-like part material 17 and inner skin from the plate-like part material 17, and excises partially only the periphery of the position where a clamping bolt 19 penetrates the magnetic material bore of a shaft-orientations outside from the plate-like part material 17 of the magnetic-flux shunt 13.
[0024] Thus, since it considered only as the periphery of the position where a clamping bolt 19 penetrates the level difference section 21 according to the gestalt 5 of enforcement, it is possible to make small the eddy current loss which the field exposed to the outside of the plate-like part material 17 becomes small, and is generated by the plate-like part material 17 as compared with the gestalt 3 of enforcement.
[0025] Gestalt 6. drawing 11 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 6 of implementation of this invention. In drawing, also in the gestalt 4 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. 22 is a tubed insulation component which forms in the cone configuration where the inner skin of the magnetic-flux shunt 13 was met, is arranged so that it may intervene between edge 16a of the magnetic-flux shunt 13 and the stator coil 16, for example, becomes by glass epoxy material etc.
[0026] Thus, since it was made to intervene the tubed insulation component 22 among edge 16a of the magnetic-flux shunt 13 and the stator coil 16, while the surface potential of edge 16a of the stator coil 16 can secure the fraction of the high voltage, and the distance for insulation between the magnetic-flux shunts 13 according to the gestalt 6 of enforcement, it is possible to support edge 16a of the stator coil 16 firmly.
[0027] Gestalt 7. drawing 12 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 7 of implementation of this invention. In drawing, also in the gestalt 6 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. Form 23 in the cone configuration where it met through the predetermined clearance between edge 16a of the stator coil 16 at the inner skin of the magnetic-flux shunt 13 among edge 16a of the magnetic-flux shunt 13 and the stator coil 16, and it is arranged. For example, it is the rectangle-like insulation component which hoop-direction two or more arrangement of the tubed insulation component which becomes with glass epoxy etc., and 24 was carried out in the clearance between edge 16a of the tubed insulation component 23 and the stator coil

16, for example, was formed in the shape of a rectangle by glass epoxy material etc. It binds to edge 16a of the stator coil 16 here, and is bound tight and fixed to it with the string 25 or a pad.
[0028] Thus, according to the gestalt 7 of enforcement While the tubed insulation component 23 is arranged through a predetermined clearance between edge 16a of a fixed coil 16 among edge 16a of the magnetic-flux shunt 13 and the stator coil 16 Since the rectangle-like insulation component 24 is arranged in a predetermined clearance, the rectangle-like insulation component 24 is bound tight to edge 16a of the stator coil 16 and it was made to fix While the distance for insulation between edge 16a of the stator coil 16 and the magnetic-flux shunt 13 is secured, it is possible to support edge 16a of the stator coil 16 firmly. In addition, although the gestalt 7 of the above-mentioned implementation showed what bound the rectangle-like insulation component 24 to edge 16a of the stator coil 16, support will become still firm if the tubed insulation component 23 is similarly fixed to the magnetic-flux shunt 13.
[0029] Gestalt 8. drawing 13 of enforcement is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 8 of implementation of this invention. In drawing, also in the gestalt 7 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. 26 is a wedge-like insulation component which forms a couple in the clearance between edge 16a of the tubed insulation component 23 and the stator coil 16 in the shape of a wedge, and were inserted in the hoop direction and which becomes, for example by glass epoxy material etc.
[0030] Thus, according to the gestalt 8 of enforcement, since the wedge-like component 26 of a couple is inserted in the clearance between edge 16a of the tubed insulation component 23 and the stator coil 16 and it was made to fix to it, it is possible to be able to fix the tubed insulation component 23 easily and to support edge 16a of the stator coil 16 firmly.
[0031] The cross section in which gestalt 9. drawing 14 of enforcement shows the configuration of the superconductivity rotation electrical machinery in the gestalt 9 of implementation of this invention, and drawing 15 are the plans in alignment with line XIV-XIV in drawing 14 . In drawing, also in the gestalt 7 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. Two or more air holes prepared by penetrating 27 from the radial inside to an outside to the magnetic-flux shunt 13 at a radial and 28 are the slots for aeration which carry out opening to the exterior of run through shaft orientations, and were established in the field which receives with the air hole 27 of the tubed insulation component 23 outside at an air hole 27 and shaft orientations.
[0032] Thus, since the slot for aeration 28 which carries out opening to the exterior of run through shaft orientations at an air hole 27 and shaft orientations is established in the field which receives the magnetic-flux shunt 13 with the air hole 27 of the tubed insulation component 23 while two or more air holes 27 penetrated at a radial are formed outside from the radial inside according to the gestalt 9 of enforcement, the aeration circuit of a refrigerant gas can be formed, the magnetic-flux shunt 13 can be cooled effectively, and overheating can be prevented.
[0033] The cross section in which gestalt 10. drawing 16 of enforcement shows the configuration of the superconductivity rotation electrical machinery in the gestalt 10 of implementation of this invention, and drawing 17 are the plans in alignment with line XVI-XVI in drawing 16 . In drawing, also in the gestalt 8 of enforcement, the same fraction attaches the same sign, and the explanation is omitted. 29 is the slot for aeration which carries out opening to the exterior of run through shaft orientations, and was established in the field which receives with the air hole 27 of the tubed insulation component 23 outside at an air hole 27, shaft orientations, and the hoop direction.
[0034] Thus, since the slot for aeration 29 which carries out opening to the exterior of run through shaft orientations at an air hole 27, shaft orientations, and a hoop direction is established in the field which receives with the air hole 27 of the tubed insulation component 23 which touches an air hole 27 according to the gestalt 10 of enforcement, the aeration circuit of a cooling gas can be formed, the magnetic-flux shunt 13 can be cooled still effectively, and overheating can be prevented.
[0035]
[Effect of the invention] The stator core which has been arranged on this core through a void as mentioned above at the outer-diameter side of the rotator wound with the superconductivity rotator coil according to the claim 1 of this invention, The magnetic-flux shunt which carries out the laminating of the magnetic material to shaft orientations, was formed in the shape of a cylinder, makes inner skin an outside breadth and was installed in the both ends of a stator core, In the stator of the superconductivity rotation electrical machinery equipped with the stator coil with which the stator core was wound, and both ends project and were formed to near the shaft-orientations ends of the superconductivity rotator coil of a rotator Since the shaft-orientations edge of a magnetic-flux shunt was located outside the shaft-orientations ends of a superconductivity rotator coil, the stator of the superconductivity rotation electrical machinery with possible making overheating by the eddy current loss by the side of the stator core edge which occurs by leakage flux prevent can be offered.
[0036] Moreover, since according to the claim 2 of this invention it is unified in the claim 1 by ****ing the pressure plate ****ed by the shaft-orientations edge of a magnetic-flux shunt while a magnetic-flux shunt makes the plate-like part material which has the predetermined rigidity between magnetic material laminatings, and was formed at least one place intervene The equation of the **** of the laminating side of a magnetic-flux shunt can be carried out, and the stator of the superconductivity rotation electrical machinery which a stator core is bound tight firmly and can carry out it can be offered.
[0037] Moreover, since according to the claim 3 of this invention it is formed in a claim 2 so that the magnetic material of a shaft-orientations outside may have a level difference in plate-like part material and inner skin from plate-like part material, and **** of plate-like part material was made possible through the level difference section, bolting by the side of a bore is strengthened, and the stator of the superconductivity rotation electrical machinery which a stator core is bound tight still firmly and can carry out it can be offered.
[0038] Moreover, according to the claim 4 of this invention, in claims 2 or 3, since the pressure plate is formed in the ring

configuration, it can offer the stator of the superconductivity rotation electrical machinery which a stator core is bound tight firmly and can carry out it.
[0039] Moreover, since it was made to intervene the tubed insulation component formed along with the inner skin of a magnetic-flux shunt between the magnetic-flux shunt and the stator coil end in the claim 1 according to the claim 5 of this invention, while the distance for insulation between both is securable, the stator of the superconductivity rotation electrical machinery which can support a stator coil end firmly can be offered.
[0040] Moreover, according to the claim 6 of this invention, it sets to a claim 1. Since a rectangle-like insulation component is arranged in a clearance, a rectangle-like insulation component is bound tight to a stator coil end and it was made to fix while the tubed insulation component formed along with the inner skin of a magnetic-flux shunt through the predetermined clearance between stator coil ends between the magnetic-flux shunt and the stator coil end had been arranged The stator of the superconductivity rotation electrical machinery which can support a stator coil end still firmly can be offered.
[0041] Moreover, according to the claim 7 of this invention, it sets to a claim 1. Since the wedge-like insulation component of a couple was inserted in the clearance and it fixed to it while the tubed insulation component formed along with the inner skin of a magnetic-flux shunt through the predetermined clearance between stator coil ends between the magnetic-flux shunt and the stator coil end had been arranged The stator of the superconductivity rotation electrical machinery which a tubed insulation component can be fixed easily and can support a stator coil end firmly can be offered.
[0042] Moreover, according to the claim 8 of this invention, it sets to the claim 5 or either of 7. Since the slot for aeration which carries out opening to the exterior of an air hole and run through shaft orientations is formed in the field which receives with the air hole of a tubed insulation component while it has two or more air holes penetrated from the radial inside outside to a magnetic-flux shunt at a radial The stator of the superconductivity rotation electrical machinery which the aeration circuit of a refrigerant gas is formed, and a magnetic-flux shunt is cooled effectively, and can prevent overheating can be offered.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the invention] The stator core which has been arranged on this core through a void as mentioned above at the outer-diameter side of the rotator wound with the superconductivity rotator coil according to the claim 1 of this invention, The magnetic-flux shunt which carries out the laminating of the magnetic material to shaft orientations, was formed in the shape of a cylinder, makes inner skin an outside breadth and was installed in the both ends of a stator core, In the stator of the superconductivity rotation electrical machinery equipped with the stator coil with which the stator core was wound, and both ends project and were formed to near the shaft-orientations ends of the superconductivity rotator coil of a rotator Since the shaft-orientations edge of a magnetic-flux shunt was located outside the shaft-orientations ends of a superconductivity rotator coil, the stator of the superconductivity rotation electrical machinery with possible making overheating by the eddy current loss by the side of the stator core edge which occurs by leakage flux prevent can be offered.
[0036] Moreover, since according to the claim 2 of this invention it is unified in the claim 1 by ****ing the pressure plate ****ed by the shaft-orientations edge of a magnetic-flux shunt while a magnetic-flux shunt makes the plate-like part material which has the predetermined rigidity between magnetic material laminatings, and was formed at least one place intervene The equation of the **** of the laminating side of a magnetic-flux shunt can be carried out, and the stator of the superconductivity rotation electrical machinery which a stator core is bound tight firmly and can carry out it can be offered.
[0037] Moreover, since according to the claim 3 of this invention it is formed in a claim 2 so that the magnetic material of a shaft-orientations outside may have a level difference in plate-like part material and inner skin from plate-like part material, and **** of plate-like part material was made possible through the level difference section, bolting by the side of a bore is strengthened, and the stator of the superconductivity rotation electrical machinery which a stator core is bound tight still firmly and can carry out it can be offered.
[0038] Moreover, according to the claim 4 of this invention, in claims 2 or 3, since the pressure plate is formed in the ring configuration, it can offer the stator of the superconductivity rotation electrical machinery which a stator core is bound tight firmly and can carry out it.
[0039] Moreover, since it was made to intervene the tubed insulation component formed along with the inner skin of a magnetic-flux shunt between the magnetic-flux shunt and the stator coil end in the claim 1 according to the claim 5 of this invention, while the distance for insulation between both is securable, the stator of the superconductivity rotation electrical machinery which can support a stator coil end firmly can be offered.
[0040] Moreover, according to the claim 6 of this invention, it sets to a claim 1. Since a rectangle-like insulation component is arranged in a clearance, a rectangle-like insulation component is bound tight to a stator coil end and it was made to fix while the tubed insulation component formed along with the inner skin of a magnetic-flux shunt through the predetermined clearance between stator coil ends between the magnetic-flux shunt and the stator coil end had been arranged The stator of the superconductivity rotation electrical machinery which can support a stator coil end still firmly can be offered.
[0041] Moreover, according to the claim 7 of this invention, it sets to a claim 1. Since the wedge-like insulation component of a couple was inserted in the clearance and it fixed to it while the tubed insulation component formed along with the inner skin of a magnetic-flux shunt through the predetermined clearance between stator coil ends between the magnetic-flux shunt and the stator coil end had been arranged The stator of the superconductivity rotation electrical machinery which a tubed insulation component can be fixed easily and can support a stator coil end firmly can be offered.
[0042] Moreover, according to the claim 8 of this invention, it sets to the claim 5 or either of 7. Since the slot for aeration which carries out opening to the exterior of an air hole and run through shaft orientations is formed in the field which receives with the air hole of a tubed insulation component while it has two or more air holes penetrated from the radial inside outside to a magnetic-flux shunt at a radial The stator of the superconductivity rotation electrical machinery which the aeration circuit of a refrigerant gas is formed, and a magnetic-flux shunt is cooled effectively, and can prevent overheating can be offered.

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DESCRIPTION OF DRAWINGS

[An easy explanation of a drawing]
[Drawing 1] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 1 of implementation of this invention.
[Drawing 2] It is a partial side elevation in drawing 1 .
[Drawing 3] It is flowing explanatory drawing of leakage flux in the configuration of this invention.
[Drawing 4] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 2 of implementation of this invention.
[Drawing 5] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 3 of implementation of this invention.
[Drawing 6] It is a partial side elevation in drawing 5 .
[Drawing 7] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 4 of implementation of this invention.
[Drawing 8] It is a partial side elevation in drawing 7 .
[Drawing 9] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 5 of implementation of this invention.
[Drawing 10] It is a partial side elevation in drawing 9 .
[Drawing 11] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 6 of implementation of this invention.
[Drawing 12] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 7 of implementation of this invention.
[Drawing 13] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 8 of implementation of this invention.
[Drawing 14] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 9 of implementation of this invention.
[Drawing 15] It is a plan in alignment with line XIV-XIV in drawing 14 .
[Drawing 16] It is the cross section showing the configuration of the superconductivity rotation electrical machinery in the gestalt 10 of implementation of this invention.
[Drawing 17] It is a plan in alignment with line XVI-XVI in drawing 16 .
[Drawing 18] It is the cross section showing the configuration of the conventional superconductivity rotation electrical machinery.
[Drawing 19] It is a partial side elevation in drawing 18 .
[Drawing 20] It is flowing explanatory drawing of leakage flux in the conventional configuration.
[An explanation of a sign]
9 Rotator, 10 Superconductivity Rotator Coil, 10a Superconductivity Rotator End Winding, 11 A stator core, 13 A magnetic-flux shunt, 13a Magnetic-flux shunt edge, 14 A pressure plate, 15 A clamping bolt, 16 Stator coil, 16a A stator coil end, 17 Plate-like part material, 18 Level difference section, 19 A clamping bolt, 20 A pressure plate, 21 The level difference section, 22 A tubed insulation component, 23 A tubed insulation component, 24 A rectangle-like insulation component, 26 A wedge-like insulation component, 27 An air hole, 28 The slot for aeration, 29 Slot for aeration.

[Translation done.]